SPECIAL PROJECT SPECIFICATIONS

45N4W18-001 FR3132 Over Sweiger Creek

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Prepared for:

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Table of Contents

Preface

Preface_wo_03_15_2004_m

Delete all but the first paragraph and add the following:

The Forest Service, US Department of Agriculture has adopted FP-03 for construction of National Forest System Roads.

101 - Terms, Format, and Definitions

101.01_nat_us_01_22_2009

101.01 Meaning of Terms

Delete all references to the TAR (Transportation Acquisition Regulations) in the specifications.

101.03_nat_us_06_16_2006

101.3 Abbreviations.

Add the following to (a) Acronyms:

AFPA	American Forest and Paper Association
MSHA	Mine Safety and Health Administration
NIST	National Institute of Standards and Technology
NESC	National Electrical Safety Code
WCLIB	West Coast Lumber Inspection Bureau

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Add the following to (b) SI symbols:

mp	Milepost
ppm	Part Per Million

101.04_nat_us_03_29_2007

101.4 Definitions.

Delete the following definitions and substitute the following:

Bid Schedule--The Schedule of Items.

Bridge--No definition.

Contractor--The individual or legal entity contracting with the Government for performance of prescribed work. In a timber sale contract, the contractor is the "purchaser".

Culvert--No definition.

Right-of-Way--A general term denoting (1) the privilege to pass over land in some particular line (including easement, lease, permit, or license to occupy, use, or traverse public or private lands), or (2) Real property necessary for the project, including roadway, buffer areas, access, and drainage areas.

Add the following:

Adjustment in Contract Price--"Equitable adjustment," as used in the Federal Acquisition Regulations, or "construction cost adjustment," as used in the Timber Sale Contract, as applicable.

Change--"Change" means "change order" as used in the Federal Acquisition Regulations, or "design change" as used in the Timber Sale Contract.

Design Quantity--"Design quantity" is a Forest Service method of measurement from the FS-96 *Forest Service Specifications for the Construction of Roads and Bridges.* Under these FP specifications this term is replaced by the term "Contract Quantities".

Forest Service--The United States of America, acting through the Forest Service, U.S. Department of Agriculture.

Neat Line--A line defining the proposed or specified limits of an excavation or structure.

Pioneer Road--Temporary construction access built along the route of the project.

Purchaser--The individual, partnership, joint venture, or corporation contracting with the Government under the terms of a Timber Sale Contract and acting independently or through agents, employees, or subcontractors.

Protected Streamcourse--A drainage shown on the plans or timber sale area map that requires designated mitigation measures.

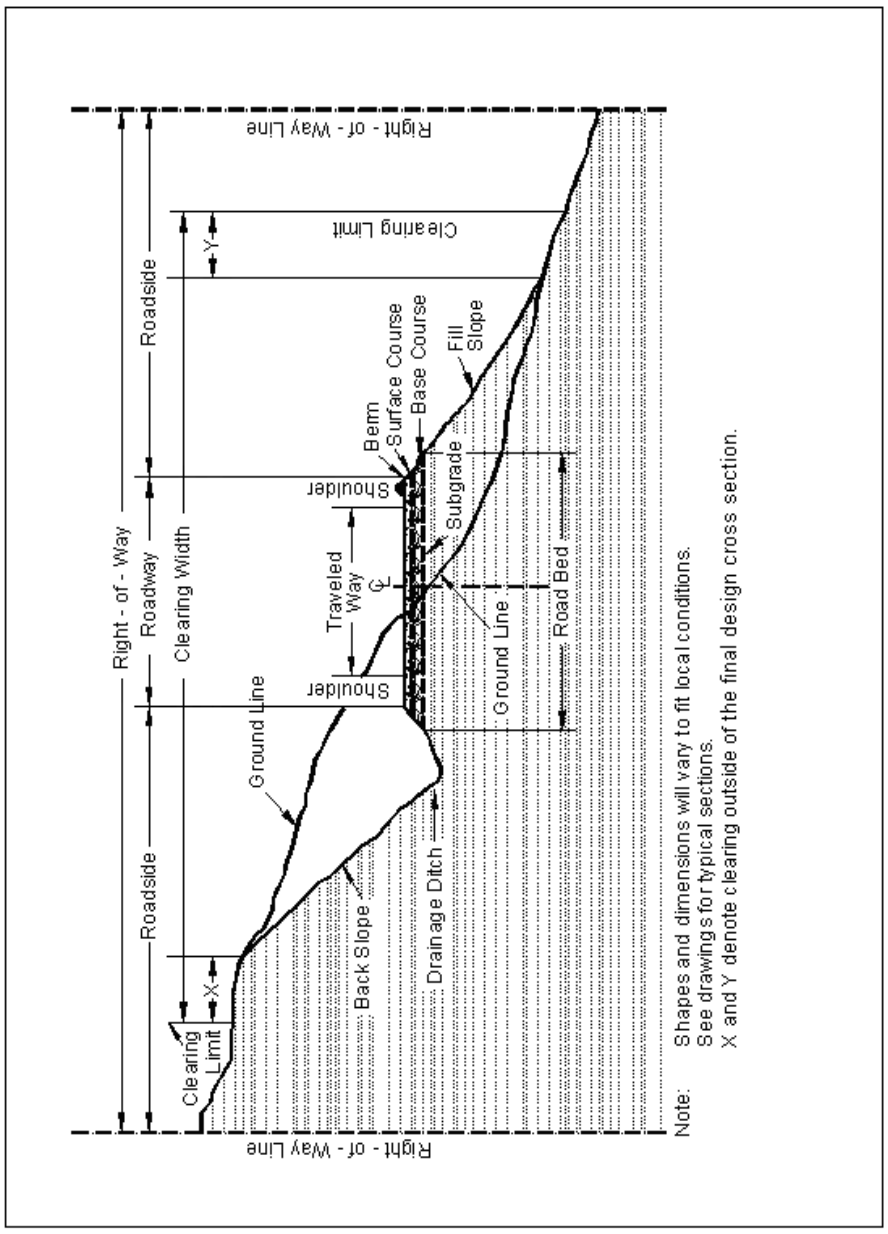
Road Order--An order affecting and controlling traffic on roads under Forest Service jurisdiction. Road Orders are issued by a designated Forest Officer under the authorities of 36 CFR, part 260.

Schedule of Items--A schedule in the contract that contains a listing and description of construction items, quantities, units of measure, unit price, and amount.

Utilization Standards--The minimum size and percent soundness of trees described in the specifications to determine merchantable timber.

Add Figure 101-1—Illustration of road structure terms:

Figure 101-1—Illustration of road structure terms.



102 - Bid, Award, and Execution of Contract

102.00_nat_us_02_16_2005

102 Bid, Award, and Execution of Contract

Delete Section 102 in its entirety.

103 - Scope of Work

103.00_nat_us_02_16_2005

Deletions

Delete all but subsection 103.01 Intent of Contract.

104 - Control of Work

104.00_nat_us_06_16_2006

Deletions

Delete Sections 104.01 and 104.04.

104.06_nat_us_02_17_2005

Add the following subsection:

104.06 Use of Roads by Contractor

The Contractor is authorized to use roads under the jurisdiction of the Forest Service for all activities necessary to complete this contract, subject to the limitations and authorizations designated in the Road Order(s) or described in the contract, when such use will not damage the roads or national forest resources, and when traffic can be accommodated safely.

105 - Control of Material

105.02_nat_us_01_18_2007

105.02 Material Sources.

105.02(a) Government-provided sources.

Add the following:

Locating and obtaining a source for aggregate shall be the responsibility of the Contractor. A pre-approved source is the government's existing crushed aggregate stockpile in the Trout Brook Pit located in T44N, R4W, S22. If the Contractor requests to use this material, a processing fee if $7.00/CYD and a pit reclamation fee of $0.25/CYD would apply. Materials testing for aggregate as described in Section 301 would not be required. In-place compaction testing would still be required.

Comply with the requirements of 30 CFR 56, subparts B and H. Use all suitable material for aggregate regardless of size unless otherwise designated. When required, re-establish vegetation in disturbed areas according to section 625.

105.05_nat_us_05_12_2004

105.05 Use of Material Found in the Work.

Delete 105.05 (a) and (b) and the last sentence of the second paragraph and substitute the following:

Materials produced or processed from Government lands in excess of the quantities required for performance of this contract are the property of the Government. The Government is not obligated to make reimbursement for the cost of producing these materials.

106 - Acceptance of Work

106.07_nat_us_05_11_2004

106.07 Delete

Delete subsection 106.07.

107 - Legal Relations and Responsibility to the Public

107.05_nat_us_05_11_2004

107.5 Responsibility for Damage Claims.

Delete the entire subsection.

107.06_nat_us_06_16_2006

107.6 Contractor's Responsibility for Work.

Delete the following from the first paragraph.

"except as provided in Subsection 106.07".

107.09_nat_us_06_16_2006

107.9 Legal Relationship of the Parties.

Delete the entire subsection.

107.10_nat_us_06_16_2006

107.10 Environmental Protection.

Add the following:

Design and locate equipment repair shops, stationary refueling sites, or other facilities to minimize the potential and impacts of hazardous material spills on Government land.

Before beginning any work, submit a Hazardous Spill Plan. List actions to be taken in the event of a spill. Incorporate preventive measures to be taken, such as the location of mobile refueling facilities, storage and handling of hazardous materials, and similar information. Immediately notify the CO of all hazardous material spills. Provide a written narrative report form no later than 24 hours after the initial report and include the following:

- Description of the item spilled (including identity, quantity, manifest number, and other identifying information).
- Whether amount spilled is EPA or state reportable, and if so whether it was reported, and to whom.
- Exact time and location of spill including a description of the area involved.
- Containment procedures.
- Summary of any communications the Contractor had with news media, Federal, state and local regulatory agencies and officials, or Forest Service officials.
- Description of clean-up procedures employed or to be employed at the site including final disposition and disposal location of spill residue.

When available provide copies of all spill related clean up and closure documentation and correspondence from regulatory agencies.

The Contractor is solely responsible for all spills or leaks that occur during the performance of this contract. Clean up spills or leaks to the satisfaction of the CO and in a manner that complies with Federal, state, and local laws and regulations.

108 - Prosecution and Progress

108.00_nat_us_02_16_2005

108 Delete.

Delete Section 108 in its entirety.

109 - Measurement and Payment

109.00_nat_us_02_17_2005

109 Deletions

Delete the following entire subsections:

109.6 Pricing of Adjustments.

109.7 Eliminated Work.

109.8 Progress Payments.

109.9 Final Payment.

109.02_nat_us_06_16_2006

109.02 Measurement Terms and Definitions.

(b) Contract quantity.

Add the following:

Contract quantities will be adjusted only when there are errors in the original design of 15% or more.

Change the following:

"(b) Cubic yard" to "(c) Cubic yard".

Add the following definition:

(p) Thousand Board Feet (Mbf). 1,000 board feet based on nominal widths, thickness, and extreme usable length of each piece of lumber or timber actually incorporated in the job. For glued laminated timber, 1,000 board feet based on actual width, thickness, and length of each piece actually incorporated in the job.

152 - Construction Survey and Staking

152.00_nat_us_08_05_2005

Description

152.01(c) Material.

Add the following:

Use required stake dimensions and materials. Pre-paint the top 2 inches of all stakes and lath, or mark them with plastic flagging. Use designated colors for paint or flagging. Mark all stakes with a stake pencil that leaves a legible imprint, or with waterproof ink.

Do not use aerosol spray paints.

Use moisture-resistant paper for survey notes. Keep notes in books with covers that will protect the contents and retain the pages in numerical sequence.

Construction Requirements

152.2 General.

Delete the first two sentences.

Add the following:

When indicated on the plans, a preliminary survey line has been established on the ground. The project location line is established by offsets from this preliminary line.

Delete second sentence in second paragraph and replace with the following:

Reestablish missing reference, control lines, or stakes as necessary to control subsequent construction staking operations

152.3 Survey and Staking Requirements.

(b) Roadway cross-sections.

Replace the first two sentences with the following:

Take roadway cross-sections normal to centerline. When the centerline curve radius is less than or equal to 200 feet, take cross-sections at a maximum centerline spacing of 25 feet. When the centerline curve radius is greater that 200 feet take cross-sections at a maximum centerline spacing of 80 feet.

(c) Slope Stakes & References:

Replace section with the following:

Slope stakes and references. When required, locate slope stakes on designated portions of the road. Locate the slope stake catch points and use them to establish clearing limits and slope stake references.

Mark slope stakes with the station, the amount of cut or fill, the horizontal distance to centerline, and the slope ratios.

Place slope reference stakes at least 10 feet outside the clearing limit and mark with the offset distance to the slope stake. Place sight stakes when required.

Prior to clearing and grubbing operations, move the slope stake outside the clearing limit to the slope reference stake. After clearing and grubbing and before excavation, reset the slope stakes in their original position.

Use the designated method to establish the slope stake catchpoint.

- **Method I**—Computed Method. Use the template information shown in the plans or other Government-provided data to calculate the actual location of the catchpoint. The slope stake "catchpoint distance" provided may be used as a trial location to initiate slope staking. Recatch slope stakes on any section that does not match the staking report within the tolerances established in Table 152-2.
- **Method II**—Catchpoint Measurement Method. Determine the location of slope stake catchpoints by measuring the catchpoint distances shown in the plans or other Government-provided data.

(d) Clearing and grubbing limits.

Add the following:

Establish clearing limits on each side of the location line by measuring the required horizontal or slope distances shown in the stake notes. Mark the clearing limits with flagging or tags on trees to be left standing, or on lath. Make markings intervisible, and no more than 90 feet apart.

After establishing clearing limits, move the location line stake outside the clearing limits for station identification purposes, and mark it with horizontal distance to location line

(e) Centerline reestablishment.

Replace with the following:

Reestablish centerline from instrument control points. The maximum spacing between centerline points is 25 feet when the centerline curve radius is less than or equal to 200 feet. When the centerline curve radius is greater than 200 feet, the maximum distance between centerline points is 80 feet.

(g) Culverts.

Replace subsection with the following:

Set culvert reference stakes at all culvert locations. Set a culvert reference stake on the centerline of the culvert 10 feet from each end or beyond the clearing limit, whichever is greater. Record the following on culvert reference stakes:

(1) Diameter, actual field measured length, and type of culvert.

(2) The vertical and horizontal distance from the reference stake to the invert at the ends of the culvert.

(3) Station of actual point where culvert intersects centerline.

When required, stake headwall for culverts by setting a hub with a guard stake on each side of the culvert on line with the face of the headwall. Perform this work after clearing is completed.

152.03 (l) Miscellaneous Survey and Staking.

Add the following:

(11) Cattleguards

(12) Drain Dips

(13) Erosion Control Measures

Replace Table 152-1 with the following two tables:

Table 152-1 Tolerances for reestablishing P-line, traverse, and elevations.

Precision Class	Minimum Position Closure	Angular Accuracy (±)	L-Line Tangent Control Points[a] (±)	Vertical Closure[b] (±)
A (Bridges)	1/10,000	2 sets, direct/reverse 10 second rejection limit	N/A	0.02 ft or 0.02ft/1000ft[c]
B	1/5,000	2 sets, direct/reverse 20 second rejection limit	0.1 ft	0.02 ft or 0.02ft/1000ft[c]
C	1/1,000	1 set, direct/reverse 1 minute rejection limit	0.2 ft	0.5ft/1000ft[c]
D	1/300	Foresight and backsight; 15 minute rejection limit[c]	0.4 ft	1.0ft/1000ft[c]
E	1/100	Foresight and backsight; 30 minute rejection limit[c]	0.8 ft	1.0ft/1000ft[c]

a. Accuracy of offset measurement.

b. Determine vertical closures at intervals not to exceed 2000 ft as measured along centerline.

c. Use greater value.

Table 152-2 Cross section and slope stake tolerances.

Item	Tolerances				
	A	B	C	D	E
Allowable deviation of cross-section line projection from a true perpendicular to tangents, a true bisector of angle points, or a true radius of curves	(±)2°	(±)3°	(±)3°	(±)5°	(±)5°
Take cross-sections topography measurements so that variations in ground from a straight line connecting the cross-section points will not exceed	0.5 ft	1.0 ft	2.0 ft	2.0 ft	3.0 ft
Horizontal and vertical accuracy for cross-sections, in feet or percentage of horizontal distance measured from traverse line, whichever is greater.	0.1 ft or 0.4%	0.15 ft or 0.6%	0.2 ft or 1.0%	0.2 ft or 1.0%	0.3 ft or 1.0%
Horizontal and vertical accuracy for slope stake, slope stake references, and clearing limits. In feet or percentage of horizontal distance measured from centerline or reference stake, whichever is greater.					
Slope reference stakes and slope stakes.	0.1 ft or 0.4%	0.15 ft or 0.6%	0.2 ft or 1.0%	0.2 ft or 1.0%	0.3 ft or 1.0%
Clearing limits	1.0 ft	1.0 ft	1.0 ft	1.5 ft	2.5 ft

153 - Contractor Quality Control

153.02_nat_us_02_17_2005

153.02 Contractor Quality Control Plan.

Add the following:

Submit written proposals for approval of alternate AASHTO or State approved test methods. Alternate methods may be allowed based on documented equivalence to the specified method.

153.04_nat_us_10_24_2007

153.04 Records.

Delete all but the first sentence

155 - Schedules for Construction Contracts

155.00_nat_us_05_11_2004

155 Delete.

Delete Section 155 in its entirety.

156 - Public Traffic

156.03_nat_us_02_24_2005

156.3 Accommodating Traffic During Work.

Delete the following from the last paragraph:

according to Subsection 106.07(b)

156.04_nat_us_02_24_2005

156.4 Maintaining Roadways During Work.

(a) Add the following:

Do not construct detours outside of the clearing limits or use alternate route detours without the approval of the CO.

156.08_nat_us_02_24_2005

156.08 Traffic and Safety Supervisor.

Delete this subsection in its entirety.

157 - Soil Erosion Control

157.03_nat_us_02_24_2005

157.03 General

Delete the entire subsection and replace with the following:

Prior to the start of construction, submit a written plan that provides permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction. Do not begin work until the necessary controls for that particular phase of work have been implemented. Do not modify the type, size, or location of any control. An alternate erosion control plan with all necessary permits may be submitted 30 days before intended use.

Incorporate all permanent erosion control features into the project at the earliest practicable time, as outlined in the approved plan.

When erosion control measures are not functioning as intended, immediately take corrective action.

171 – Weed Prevention

Description

171.1 This work consists of washing and treating construction equipment to remove seeds, plants, and plant fragments from the equipment before the equipment is used on National Forest System Lands.

Material

171.2 Conform to the following Subsection:

Water	725.01

Construction Requirements

171.3 General. Notify the CO in writing at least 15 days before moving any construction equipment onto National Forest System Lands. Construction equipment does not include cars, pickup trucks, and other vehicles that regularly travel between the construction site and areas outside of National Forest System lands.

Perform all work at a location designated on the plans or other location approved in writing. Provide the CO with an opportunity to monitor the washing and inspection.

171.4 Equipment. Use a high pressure washing system.

For work on National Forest System lands, use a washing system that traps all wash water and either stores it for removal from National Forest System lands or recycles the water for continued use. If the equipment recycles the water, provide adequate filters for seed removal. Dispose of the filter material and removed seeds in an approved manner. Do not mix soaps, detergents, or other chemicals with the wash water.

For work at a commercial washing facility, use and approved facility.

171.5 Washing. Wash the sides, tops, and undercarriages of all construction equipment. Remove all seeds, plants, plant fragments, dirt, and debris from the construction equipment. Only equipment inspected by the Forest Service will be allowed to operate within the project area. All subsequent move-ins of equipment to the project area will be treated in the same manner as the initial move-in.

171.6 Inspection. Inspect the washed construction equipment, including the undercarriage, to ensure that the washing removed the dirt, debris, and seeds from the equipment. Rewash as necessary or as directed.

171.7 Acceptance. Performance of this work will be evaluated under Subsection 106.02.

171.8 Measurement. Do not measure Weed Prevention for payment.

171.9 Payment. Include all costs associated with the Section 171 – Weed Prevention in the unit price for Mobilization.

201 - Clearing and Grubbing

201.00_nat_us_08_05_2009

201.2 Material:

Delete Tree wound dressing material reference.

201.3 General.

Delete the last sentence.

201.4 Clearing.

Delete the last sentence of (d).

203 - Removal of Structures and Obstructions

203.01_nat_us_02_25_2005

203.01 Description.

Delete and replace with the following:

This work consists of disposing of construction debris, salvaging, removing, and disposing of buildings, fences, structures, pavements, culverts, utilities, curbs, sidewalks, guardrail, and other obstructions.

203.05_nat_us_02_18_2005

203.05 Disposing of Material.

Add the following:

(g) Chipping or Grinding. Use an approved chipping machine to grind slash and stumps greater than 3 inches in diameter and longer than 3 feet. Deposit chips or ground woody material on embankment slopes or outside the roadway to a loose depth less than 6 inches. Minor amounts of chips or ground woody material may be permitted within the roadway if they are thoroughly mixed with soil and do not form a layer.

(i) Decking Firewood Material. Remove brush from decks. Limb and deck logs that do not meet Utilization Standards according to Subsection 201.04 as directed by the CO. Cut logs to lengths less than 30 feet. Ensure that logs stacks are stable and free of brush and soil.

203.08_nat_us_02_24_2005

203.08 Payment

Add the following:

Disposal of construction slash will be compensated under the designated pay item in Section 201.

Lean Concrete will not be paid separately, but will be included in the Removal of Structures and Obstructions pay item.

Earthwork items required for removal of culverts are included in the Removal of Structures and Obstructions pay item.

204 - Excavation and Embankment

204.11 Compaction.

Delete Section 204.11 and replace with the following:

204.11 Compaction. Compact the embankment using one of the following methods as specified:

(a) Compaction A. Use AASHTO T 27 to determine the amount of material retained on a Number 4 sieve. If there is more than 80 percent retained on the No. 4 sieve use procedure (1). If there is 50 to 80 percent retained on the No. 4 sieve use procedure (2). If there is less than 50 percent retained on the No. 4 sieve use procedure (3).

(1) Adjust the moisture content to a level suitable for compaction. Fill the interstices around rock with earth or other fine material as practical. Use compression-type rollers at speeds less than 6feet per second and vibratory rollers at speeds less than 3 feet per second. Compact each layer of material full width with one of the following and until there is no visible evidence of further consolidation.

(a) Four roller passes of a vibratory roller having a minimum dynamic force of 40,000 pounds impact per vibration and a minimum frequency of 1000 vibrations per minute.
(b) Eight roller passes of a 20-ton compression-type roller.
(c) Eight roller passes of a vibratory roller having a minimum dynamic force of 30,000 pounds impact per vibration and a minimum frequency of 1000 vibrations per minute.

Increase the compactive effort for layers deeper than 12 inches as follows:

- For each additional 6 inches or fraction thereof, increase the number of roller passes in (a) above by four passes.
- For each additional 6 inches or fraction thereof, increase the number of roller passes in (b) and (c) above, by eight passes.

(2) Use AASHTO T 99 to determine the optimum moisture content of the portion of the material passing a No. 4 sieve. Multiply this number by the percentage of material passing a No. 4 sieve, and add 2 percent to determine the optimum moisture content of the material. Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content.

Use compression-type rollers at speeds less than 6 feet per second and vibratory rollers at speeds less than 3 feet per second. Compact each layer of material full width according to (1) above.

(3) Classify the material according to AASHTO M 145. For material classified A-1 or A-2-4, determine the maximum density according to AASHTO T 180, method D, or Michigan Cone Method. For other material classifications, determine the optimum moisture content and maximum density according to AASHTO T 99, method C.

Adjust the moisture content of material classified A-1 through A-5 to a moisture content suitable for compaction. Adjust the moisture content of material classified A-6 and A-7 to within 2 percent of the optimum moisture content.

Use compression-type or vibratory rollers. Compact each layer of material full width to at least 95 percent of the maximum density. Determine the in-place density and moisture content according to AASHTO T 310 or other approved test procedures. When required, use AASHTO T 224 to correct for coarse particles.

(b) Compaction B. Place material by end dumping to the minimum depth needed for operation of spreading equipment. Adjust the moisture content of the material to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Operate compaction equipment over the full width of each layer until there is no visible evidence of further consolidation or, if when a sheepsfoot roller is used, the roller "walks out" of the layer. Make at least three complete passes.

(c) Compaction C. Place material by end dumping to the minimum depth needed for operation of spreading equipment. Level and smooth each embankment layer before placing the next layers. Operate hauling and spreading equipment uniformly over the full width of each layer. Construct a solid embankment with adequate compaction by working smaller rock and fines in with the larger rocks to fill the voids, and by operating hauling and spreading equipment uniformly over the full width of each layer as the embankment is constructed.

204.13 Sloping, Shaping, and Finishing.

Delete subsection d and replace with:

(d) Finishing. Finish the roadbed to be smooth and uniform, and shaped to conform to the typical sections. Remove unsuitable material from the roadbed and replace it with suitable material. Finish roadbeds to the tolerance class shown in table 204-2.Ensure that the subgrade is visibly moist during shaping and dressing. Scarify to 6 inches below the bottom of low sections, holes, cracks, or depressions and bring back to grade with suitable material. Maintain proper ditch drainage.

For surfaced roads, remove all material larger than 6 inches from the top 6 inches of the roadbed.

For unsurfaced roads, use one of the following methods to finish the roadbed:

(1) Method A. Remove all material larger than 6 inches from the top 6 inches of the roadbed and replace with suitable material.
(2) Method B. Use a vibratory grid roller or approved equal with a minimum weight of 10 tons. Roll at least 5 full-width passes or until there is no visible evidence of further consolidation.
(3) Method C. For roads designated as Construction Tolerance Class K, L, or M, finish the roadbed by spreading the excavation. Eliminate rock berms.

Table 204-1 Sampling and Testing Requirements

Delete Table 204-1 and replace with the following:

Table 204-1
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Topping (704.05) & unclassified borrow (704.06)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Processed material before incorporating in work	Yes, when requested	Before using in work
		Moisture-density	—	AASHTO T 180, method D(1) or Michigan	1 per soil type but not less than 1 per 13 000 yd^3	"	"	"
		Compaction	—	AASHTO T 310 or other approved	1 per 200 yd^2 but not less than 1 per layer	In-place	—	Before placing next layer
Select borrow (704.07 & Select topping (704.08)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type but not less than 1 for each day of	Processed material before	Yes, when requested	Before using in work
		Gradation	—	AASHTO T 27 & T 11	1 per source	"	"	"
		Liquid	—	AASHTO T 89	"	"	"	"
		Moisture-density	—	AASHTO T 180, method D(1)	1 per soil type but not less than ^{3}	"	"	"
		Compaction	—	AASHTO T 310 or other approved	1 per 200 yd^2 but not less than 1 per layer	In-place	—	Before placing next layer

(1) Minimum of 5 points per proctor

Table 204-1 (continued)
Sampling and Testing Requirements

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Earth embankment (204.11, Compaction A)	Measured and tested for conformance (106.04)	Classification	—	AASHTO M 145	1 per soil type	Source of Material	Yes, when requested	Before using in work
		Moisture-density	—	AASHTO T 180, method D(1) or Michigan Cone	1 per soil type but not less than 1 per 13,000 yd^3	“	“	“
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 200 yd^2 but not less than 1 per layer	In-place	—	Before placing next layer
Top of subgrade (204.11 Compaction A)	Measured and tested for conformance (106.04)	Moisture-density		AASHTO T 180, method D(1) or Michigan Cone	1 per soil type	Source of Material	Yes, when requested	Before placing next layer
		Compaction	—	AASHTO T 310 or other approved procedures	1 per 200 yd^2	In-place	—	Before placing next layer

(1) Minimum of 5 points per proctor.

Table 204-2 Construction Tolerances

Add Table 204-2:

Table 204-2
Construction Tolerances

	Tolerance Class [(a)]												
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
Roadbed width (ft)	+0.5	+0.5	+1.0	+1.0	+1.0	+1.0	+1.5	+1.0	+2.0	+2.0	+2.0	+2.0	+2.0
Subgrade elevation (ft)	±0.1	±0.2	±0.2	±0.5	±0.5	±1.0	±1.0	±1.5	±2.0	±3.0	±2.0	±3.0	(c)
Centerline alignment (ft)	±0.2	±0.2	±0.5	±0.5	±1.0	±1.0	±1.5	±1.5	±2.0	±3.0	±3.0	±5.0	(c)
Slopes, excavation, and embankment (% slope[(b)])	±3	±5	±5	±5	±5	±5	±10	±10	±10	±10	±20	±20	±20

(a) Maximum allowable deviation from construction stakes and drawings.
(b) Maximum allowable deviation from staked slope measured from slope stakes or hinge points.
(c) Unless otherwise shown the centerline alignment and subgrade elevation, as built, have no horizontal curves with a radius of less than 80 feet, and no vertical curves with a curve length of less than 80 feet when the algebraic difference in the grade change is less than 10 percent, or a curve length of less than 100 feet when the algebraic difference of the grade change is greater than or equal to 10 percent. The centerline grade is not to exceed 20 percent in 100 feet of length.

208 - Structure Excavation and Backfill for Selected Major Structures

208.04_nat_us_08_05_2009

Construction Requirements

208.04 General.

Add the following to the end of the second sentence of the third paragraph:

"... to the CO a minimum of 5 days prior to beginning excavation work."

Add the following:

Contractor shall avoid disturbing the foundation material by selecting appropriate excavation equipment and methods, avoiding excessive construction traffic from traversing exposed material, and protecting from seepage and runoff. Protect the foundation material with a working course of gravel or concrete, as needed and as approved.

208.8 Dewatering.

Add the following:

Discharge dewatering water to an upland area or other approved location. Use filter bags or other approved measures to capture sediment from the discharge.

208.9 Foundation Preparation.

Add the following after the first paragraph:

The foundation elevation is defined as the bottom of footings, for spread footing placement; the bottom of the pile cap, for construction of pile foundations; the bottom of culverts, for box culvert placement, and the toe of the wall, for construction of retaining walls, except wingwalls at bridges.

Replace all material from any over-excavation below the designated footing elevation with concrete, compacted gravel, or foundation fill at the direction of the CO.

When boulders or irregular, fractured, or seamed bedrock precludes excavation to the designated footing elevation without further loosening of previously solid material, the CO may order removal of such loose material and allow payment for concrete, gravel, or structural backfill that is required to restore foundation material to the designated elevation

208.13 Measurement.

Add the following paragraph:

Foundation over-excavation and the resulting replacement material will not be measured for payment unless the CO determines the over-excavation was unavoidable because of the nature of the material.

208.14 Payment.

Add the following:

Payment for dewatering, filter bags and other sediment control, and concrete or gravel working courses are included in the pay item for cofferdam. The cofferdam pay item also includes any engineering, bracing, or tiebacks required to maintain a safe, stable excavation

209 - Structure Excavation and Backfill

Material

209.02 Material

Add the following:

Structural Backfill	704.04

Construction Requirements

209.10 Backfill.

Add the following to (a):

Backfill with structural backfill.

251 - Riprap

Measurement

251.08 Measurement

Delete and replace with the following:

Measure the Section 251 items listed in the bid schedule according to Subsection 109.02 and the following as applicable.
Measure riprap by the ton.

301 - Untreated Aggregate Courses

301.05_nat_us_10_14_2011

301.05 Compacting

Delete and replace with the following:

Compact each layer full width. Roll from the sides to the center, parallel to the centerline of the road. Along curbs, headers, walls, and all places not accessible to the roller, compact the material with approved tampers or compactors.

Compact the aggregate using one of the following methods as specified:

Compaction A. Operate spreading and hauling equipment over the full width of the travelway.

Compaction B. Operate rollers and compact as specified in Subsection 204.11(a)(1).

Compaction C. Moisten or dry the aggregate to a uniform moisture content between 5 and 7 percent based on total dry weight of the mixture. Operate rollers and compact as specified in Subsection 204.11(a)(1).

Compaction D. Compact to a density of at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

Compaction E. Removed.

Compaction F. Compact to a density of at least 95 per-cent of the maximum density, as determined by AASHTO T 180, method C or D, or Michigan Cone Method.

Compaction G. Removed.

For all compaction methods, blade the surface of each layer during the compaction operations to remove irregularities and produce a smooth, even surface. When a density requirement is specified, determine the in place density and moisture content according to AASHTO T 310 or other approved test procedures.

Table 301-1 Field Density Requirements.

Table 301-1: Delete laboratory and field density requirements for base, subbase, and surfacing and replace with the following:

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
Base and Subbase	Measured and tested conformance (Subsection 106.04)	Gradation	---	AASHTO T27 & T11	1 per type and source of material	Source of material	Yes	Before using in work
		Moisture Density	---					
		Method C	---	AASHTO T 99	1 per type and source of material	Source of material	Yes	Before using in work
			---		"	"	"	"
		Method D	---	AASHTO T 180 or Michigan Cone	"	"	"	"
			---		"	"	"	"
		Compaction	---					
		Method C, D	---	AASHTO T 310 or other approved procedures	1 per 500 t	In-place	---	Before placing the next layer
Surfacing	Measured and tested conformance (Subsection 106.04)	Gradation	---	AASHTO T27 & T11	1 per type and source of material	Source of material	Yes	Before using in work
		Moisture Density						

Material or Product	Type of Acceptance (Subsection)	Characteristic	Category	Test Methods Specifications	Sampling Frequency	Point of Sampling	Split Sample	Reporting Time
			---		"	"	"	Before using in work
		Method D	---	AASHTO T 180 or Michigan Cone	"	"	"	"
			---		"	"	"	"
		Compaction						
		Method C, D	---	AASHTO T 310 or other approved procedures	1 per 500 t	In-place	---	Before placing the next layer

403 - Hot Asphalt Concrete Pavement

403.16_nat_us_03_02_2005

403.03 Composition of Mix (Job-Mix Formula)

Delete and replace the first four paragraphs with:

Furnish mix of aggregate, asphalt binder, recycled asphalt pavement, and additives that meet the applicable gradation and material requirements of MDOT HMA, 4E1. See the attached MDOT special provision.

403.16 Pavement Smoothness.

Delete the heading and replace with the following:

Pavement Smoothness and Surface Tolerance

Add the following:

The maximum variation from the compacted width is 3 inches and the average width of four measurements for any ½ mile of road segment (or the total project length if less than ½ mile) is the specified width.

The maximum variation from the compacted specified thickness is ¼ inch and the average thickness of four measurements for any ½ mile of road segment (or the total project length if less than ½ mile) is the specified thickness

403.17_nat_us_03_02_2005

403.17 Acceptance.

In the sampling frequency column of Table 403-1 Sampling, Testing and, Acceptance Requirements, for the characteristics: gradation, asphalt content, and compaction, add the following:

but no fewer than a minimum of 1 per shift

Section 501. PLANT PRODUCED HOT MIX ASPHALT

501.01. Description. This work consists of providing and placing Hot Mix Asphalt (HMA) mix using Superpave Mixture Design Methods.

A. **Terminology.**

Broken Aggregate. Cracked aggregate caused by construction operations.

Crack. A visible fissure of varying length and orientation in the HMA, partially or completely through at least one course.

Flushing. A shiny or reflective condition, tacky to the touch, appearing on the HMA surface when asphalt binder collects in the voids at high pavement temperatures.

HMA Mix Design. The selection and proportioning of aggregates, mineral filler, Reclaimed Asphalt Pavement (RAP), and asphalt binder to meet the mix design criteria required by the contract.

HMA Segregation. Areas of HMA pavement exhibiting non-uniform distribution of coarse and fine aggregate particles, visually or otherwise identifiable.

Job Mix Formula (JMF). An HMA mix for a specific project, including adjustments to optimize the field application.

Lot. A discrete tonnage of one mix, typically made up of five sublots.

Pavement. The completed HMA placement, including layers on driving lanes and shoulders.

Pavement Edge. The extremity boundaries of the pavement.

Roller Cracking. High density surface map-cracking that appears immediately after rolling.

Rutting. A depression or displacement of the HMA surface that occurs in a longitudinal direction or a localized area.

Sublot. A portion of a lot represented by a complete set of quality assurance tests.

Target Value. A JMF parameter value that may be adjusted, if approved by the Engineer, to account for changes in the physical properties of the mixture.

501.02. Materials. Provide materials in accordance with the following:

Superpave HMA Mixtures.....902

Superpave Aggregates 902
Mineral Filler, 3MF 902
Anti-Foaming Agent 904
Asphalt Binders 904
Bond Coat, SS-1h, CSS-1h 904

Plant produced HMA consists of asphalt binder, aggregates, mineral filler, and other additives.

Provide release agents that do not harm the HMA mixture. Do not use fuel oil or other distillate derivatives.

Provide the HMA mix type and the performance grade of asphalt binder as required by the contract.

Provide blended aggregates for HMA top course mixtures, except top courses for shoulders, bike paths, temporary roads, and parking areas, meeting the required Aggregate Wear Index (AWI).

A. **Composition of HMA Mixtures.**

1. **Mix Design.** Develop an HMA mix design in accordance with the *HMA Production Manual* and submit to the Department. The Department will evaluate the design in accordance with Section 1 of the *HMA Production Manual*, "Procedures for HMA Mix Design Processing."

   Provide written certification that the materials in the mix design are from the same source and meet the material properties in the mix design or the Department-approved JMF. Ensure that all JMF adjustments are in accordance with the *HMA Production Manual*.

   The Contractor may use mix designs approved by the Department on other projects, if approved by the Engineer. Provide combined aggregate blends meeting the properties specified in section 902. Provide a mix design that meets the requirements of Table 501-1, Table 501-2, and Table 501-3 as applied to combined aggregate blends.

   For mix design purposes, top and leveling courses are the mix layers within 4 inches of the surface. The base course consists of the layers below 4 inches from the surface. For mix layers within the 4-inch threshold, if less than 25 percent of the mix layer is within 4 inches of the surface, the mix layer is a base course.

   For projects that specify a mix type E03, the Contractor may use a mix type LVSP.

If High Stress HMA is shown on the plans, provide the same mix design as required for the mainline top and leveling courses, except change the performance graded binder as shown on the HMA application table.

Table 501-1
Superpave Mix Design Criteria

Design Parameter	Mix Number				
	5	4	3	2	LVSP
Percent of Maximum Specific Gravity (%G_{mm}) at the design number of gyrations, (N_d) (c)	96.0% (a)				
%G_{mm} at the initial number of gyrations, (N_i)	See Table 501-3				
%G_{mm} at the maximum number of gyrations, (N_m)	98.0%				
VMA min % at N_d (based on aggregate bulk specific gravity, (G_{sb})) (c)	15.00	14.00	13.00	12.00	14.00
VFA at N_d	See Table 501-2 (b)				
Fines to effective asphalt binder ratio (P_{No200}/P_{be})	0.6–1.2				
Tensile strength ratio (TSR)	80% min				

a. For mixtures meeting the definition for base course, design mixtures to 96.0% of Maximum Specific Gravity %G_{mm} at the design number of gyrations, (N_d). During field production, increase %G_{mm} at the design number of gyrations, (N_d) to 97.0%.
b. For base course or regressed shoulder mixtures, the maximum criteria limits do not apply.
c. Lower Target Air Voids by 1.0% if used in a separate shoulder paving operation, unless otherwise shown on the plans.

Table 501-2
VFA Minimum and Maximum Criteria

Estimated Traffic (million ESAL)	Mix Type	Top & Leveling Courses	Base Course
≤0.3	LVSP	70–80	70–80
≤0.3	E03	70–80	70–80
>0.3 – ≤1.0	E1	65–78	65–78
>1.0 – ≤3.0	E3	65–78	65–78
>3.0 – ≤10	E10	65–78 (a)	65–75
>10 – ≤30	E30	65–78 (a)	65–75
>30 – ≤100	E50	65–78 (a)	65–75

a. The specified VFA range for mix Number 5 is 73%–76%.

501.02

Table 501-3
Superpave Gyratory Compactor (SGC) Compaction Criteria

Estimated Traffic (million ESAL)	Mix Type	$\%G_{mm}$ at (N_i)	Number of Gyrations (a)		
			N_i	N_d	N_m
≤0.3	LVSP	91.5%	6	45	70
≤0.3	E03	91.5%	7	50	75
>0.3 – ≤1.0	E1	90.5%	7	76	117
>1.0 – ≤3.0	E3	90.5%	7	86	134
>3.0 – ≤10	E10	89.0%	8	96	152
>10 – ≤30	E30	89.0%	8	109	174
>30 – ≤100	E50	89.0%	9	126	204

a. Compact mix specimens fabricated in the SGC to N_d. Use height data provided by the SGC to calculate volumetric properties at N_i. Compact mix specimens at optimum P_b to verify N_m for mix design specimens only.

2. **Recycled Mixtures.** The Contractor may substitute Recycled Asphalt Pavement (RAP) for a portion of the new material required to produce HMA mixture. Design and produce the mix to meet the criteria in this subsection and the contract.

   a. **Stockpile Requirements.** Process RAP to the size required for the specified HMA mix. Ensure the stockpile contains enough material to produce the recycled mixtures the Engineer approves for the project. If the RAP stockpile is not sufficient to produce recycled mix quantities required for the project, provide an Engineer-approved mix design without RAP at the same unit price.

      Provide documentation of testing and accumulated tonnage in the stockpile to the MDOT laboratory. The Contractor may estimate the tonnage. The Department will begin evaluating the mix design after receipt of the documentation.

   b. **Mix Design.** Submit required documentation for recycled mix designs in accordance with Section 1 of the *HMA Production Manual*, "Procedures for HMA Mix Design Processing."

B. **HMA Plant Certification.** Ensure hot mix asphalt plants are certified by the Department at least 3 work days before mix production begins. The Engineer will certify hot mix asphalt facilities in accordance with Section 2 of the *HMA Production Manual*, "Certification Procedure of HMA Plants." Post a seal of certification in the plant control office.

C. **HMA Production.** Submit an approved mix design for the mix required to the Engineer at least 2 work days before production begins.

Ensure even heating of the mass of asphalt binders and maintain heat control. Heat asphalt binders to the temperature required for the type of binder, except ensure that neither the asphalt binder nor the HMA

exceed the maximum temperature specified in Table 904-7. The Department will reject asphalt binder and mix if the temperature exceeds the maximum specified in Table 904-7. The Department will reject contaminated asphalt binder.

Stockpile aggregates at the facility, in a manner that prevents segregation. Dry aggregates to a moisture content that will ensure an appropriately coated HMA mix. For batch and continuous plants, the Department will reject aggregates in the hot bins that contain sufficient moisture to cause foaming or a water-saturated mixture. Remove rejected materials from the bins.

Place uniform gradations of aggregates in the cold feed system. If providing a blend of aggregates for the mix by combining aggregates from at least two cold feed bins, ensure the blend meets the combined gradation (from JMF) quality control tolerances.

The Engineer will allow the use of at least one hot aggregate bin to proportion aggregates to meet the JMF tolerances, if the cold feed requirements are met.

501.03. Construction.

A. **Equipment.** Provide equipment in accordance with section 107, capable of producing pavement that meets the requirements of this section.

1. **Cold-Milling Machines.** Provide equipment that consistently removes the HMA surface, in one or more passes, to the required grade and cross section, and produces a uniformly textured surface. Provide machines equipped with the following:

   a. Automatically controlled and activated cutting drums, and
   b. Grade reference and transverse slope control capabilities.

2. **Hauling Equipment.** Ensure transport trucks are equipped to protect the mix from the weather and retard the loss of heat.

3. **Pressure Distributor.** Provide a pressure distributor in accordance with subsection 505.03.A.1.

4. **Pavers.** Equip each paver with a full-width vibratory or tamper bar screed capable of spreading and finishing HMA to the required cross section and grade. Use a paver that produces a uniformly finished surface, free of tears, other blemishes, and measurable segregation.

   Equip the paver to provide a uniform head of material ahead of the screed. Install reverse pitch augers or paddles inside the ends of the auger shafts to force the mix to the center of the main screed.

Ensure extensions, added to the main screed, provide the same vibrating or tamping action and heating capabilities as the main screed. Adjust extensions to the main screed so, after breakdown rolling, no longitudinal marks remain on the surface. Equip in-line screed extensions with a continuation of the automatically controlled spreading augers to within 12 inches of the outside edge. Follow the manufacturer's recommendations for other screed extensions.

Except for the paving operations listed in subsection 501.03.F.1.a through subsection 501.03.F.1.d, equip pavers with an automatically controlled and activated screed with grade reference and transverse slope control. Use an Engineer-approved grade referencing attachment, at least 30 feet long, for lower courses and the first pass of the top course. Ensure the Engineer approves alternate grade referencing attachments before use.

After placing the first pass of the top course, the Contractor may, with prior approval from the Engineer, substitute a joint matcher, a grade referencing attachment at least 10 feet long, or other grade referencing equipment for constructing adjacent passes of the top course.

5. **Rollers.**

   a. **Steel-Wheeled Rollers.** Provide self-propelled vibratory steel-wheeled rollers, static tandem rollers, or self-propelled static three-wheeled rollers. Provide a steering device that allows the roller to follow the established alignment. Equip rollers with wheel sprinklers and scrapers. Provide smooth roller wheels, free of openings or projections that will mar the pavement surface.

      Provide vibratory rollers with an automatic shutoff to deactivate the vibrators if the roller speed decreases below ½ mph. Provide rollers that operate in accordance with the manufacturer's recommended speed, impacts per foot, and vibration amplitude for the thickness of HMA mix.

   b. **Pneumatic-Tired Rollers.** Provide self-propelled pneumatic-tired rollers. Equip rollers with at least seven wheels spaced on two axles so the rear group of tires does not follow in the tracks of the forward group, providing at least ½-inch tire path overlap. Provide smooth tires capable of being inflated to the pressure recommended by the roller or tire manufacturer. Equip the rollers with a mechanism that can smoothly reverse the motion of the roller.

Equip the rollers with wheel scrapers and skirting to enclose the wheels to within 3 inches of the pavement surface. Use a release agent to prevent material from sticking to the tires and being deposited on the top course pavement during rolling.

c. **Combination Rollers.** The Contractor may use combination pneumatic-tired and steel-wheeled rollers manufactured specifically for HMA compaction, if equipped with the required sprinklers and scrapers.

6. **Spreaders.** Use self-propelled spreaders capable of pushing the hauling units. Ensure spreaders can maintain the required width, depth, and slope, without causing segregation.

7. **Material Transfer Device.** When a Material Transfer Device (MTD) is required, it must be capable of delivering HMA mix from the truck transport to the paver hopper to ensure constant paver speed, remixing HMA material using manufacturer's developed technology, and depositing material in the paver hopper. Provide a paver hopper insert with at least a 10 ton capacity in the paver and keep at least one-third full of mix during paving.

8. **Compressed Air System.** If a compressed air system is required for cleaning pavement, equip the air compressor with a moisture separator to remove oil and water from the air supply. Provide a compressor capable of producing at least 100 psi and continuous 150 cfm airflow.

9. **Miscellaneous Equipment.** Provide a straightedge at least 10 feet long and other tools to finish the work.

10. **Lights on Equipment.** If maintaining traffic on HMA construction, equip equipment within the project, including cold-milling machines, distributors, and rollers, with at least one Department-approved flashing, rotating, or oscillating amber light. Equip pavers with at least one light on each side. Mount the lights so the warning signal is visible to traffic in every direction. Operate the lights while work is in progress. Ensure hauling units activate four-way flashers on the project.

B. **Preparation of Base.** Provide subgrade, subbase, aggregate base course, crushed and shaped base, or rubblized base in accordance with the relevant sections of Division 2 and Division 3, before HMA placement.

C. **Preparation of Existing Pavement.** Prepare the existing surface as required to construct HMA pavements, shoulders, and approaches.

1. **Drainage Structures, Monument Boxes, and Water Shutoffs.** Adjust, temporarily lower, or both, catch basins, manhole covers, monument boxes, and water shutoffs in accordance with subsection 403.03.A.

2. **Cleaning Pavement.** Using methods approved by the Engineer, clean dirt and debris from the pavement surface and paved shoulders before placing HMA. Remove loose material from joints and cracks using compressed air.

   If the Engineer determines the compressed air system will not remove deleterious material, remove loose material by a hand or mechanical method, as approved by the Engineer. The Department will pay for removal of material by hand or mechanical methods in accordance with subsection 501.04.E.

   Do not place HMA until the Engineer inspects and approves the condition of the existing pavement.

3. **Removing Existing Pavement for Butt Joints.** If a butt joint is required, remove the existing surface to the thickness of the proposed overlay, for the full width of the joint. Uniformly taper the removal to the original surface over at least 35 feet.

4. **Edge Trimming.** For required removal of HMA shoulder material or no greater than 1 foot width of HMA pavement, cut the HMA material full depth along the pavement edge or removal line to prevent tearing the pavement surface. Cut joints, where the completed surface will be exposed, with a saw, cold-milling machine, or other methods approved by the Engineer. Cut joints, where the completed surface will be covered by HMA mix, with a coulter wheel, saw, cold-milling machine, or other method approved by the Engineer.

5. **Cold-Milling HMA Surfaces.** Before milling existing pavement, obtain a Department-approved mix design in accordance with subsection 501.02.A, and ensure the availability of HMA mix quantites to cover milled surfaces.

   Remove the HMA surface to the depth, width, grade, and cross section shown on the plans. Backfill and compact depressions resulting from removal of material below the specified grade, in accordance with subsection 501.03.C.9.

   If the milling machine discovers buried structures within the specified grade, such as valve boxes, manholes, or railroad tracks that are not identified on the plans, the Department will pay for all associated costs, as extra work, in accordance with subsection 103.02.

Immediately after cold-milling, clean the surface. Dispose of removed material in accordance with subsection 104.07.D and subsection 204.03.

6. **Removing HMA Surface.** Except as specified in subsection 501.03.C.4, removing HMA surface applies to removing HMA overlying a base course that is to remain in place.

   Cut joints, exposed in the completed surface, with a saw or cold-milling machine. Cut joints, covered by HMA mix, with a coulter wheel, saw, or cold-milling machine. Obtain the Engineer's approval of alternate methods for cutting joints.

   When removing HMA overlying a base course that is to remain in place, cut the edges of the surface requiring removal along straight lines for the full depth of the HMA surface.

   When removing HMA by cold-milling, the Engineer may direct the Contractor to remove less than the full depth of HMA surface.

7. **Removing HMA Patches.** Remove patches that may compromise the performance of the overlay.

8. **Joint and Crack Clean Out.** If the plans show joint and crack clean out, use mechanical or hand methods to remove joint sealants to at least 1 inch deep. Remove vegetation, dirt, and debris that cannot be removed using the methods specified in subsection 501.03.C.2, from transverse and longitudinal joints and cracks. Use hand patching to fill cleaned joints and cracks at least 1 inch wide.

9. **Hand Patching.** If the contract requires hand patching, fill holes, depressions, joints, and cracks in the existing pavement and replace existing patches. Compact the hand patching material in no greater than 3 inch layers to the adjacent pavement surface grade using a machine vibrator or Department-approved roller. Use top course or other Engineer-approved mix for hand patching material.

10. **Repairing Pavement Joints and Cracks.** Repair joints and cracks as required.

D. **Bond Coat.** Uniformly apply the bond coat to a clean, dry, surface with a pressure distributor. Obtain the approval of the Engineer for the application rate after work begins. Apply the bond coat ahead of the paving operation to allow the bond coat to cure before placing HMA.

Do not leave pools of bond coat on the surface and do not spray the bond coat on adjacent pavement surfaces. Apply the bond coat to each

HMA layer and to the vertical edge of the adjacent pavement before placing subsequent layers.

E. **Transportation of Mixtures.** Weigh each load of HMA, accepted by the Department, to the nearest 20 pounds on an approved scale with an automatic printout system. Provide a scale and printout system for platform and suspended scales in accordance with subsection 109.01.B.6.

Apply a release agent, in accordance with subsection 501.02, to hauling units. The Engineer will reject loads with excessive amounts of release agent. Do not place crusted HMA in the paver.

The Department will reject loads with a temperature either below 250 °F or greater than ±20 °F from the recommended maximum mixing temperature specified by the binder producer at the time of discharge from behind the screed.

F. **Placing HMA.**

1. **General.** Provide a pavement as shown on the plans.

   Place HMA on a cured bond coat using pavers in accordance with subsection 501.03.A.4, unless placing mixtures for the following:

   a. Variable width sections;
   b. The first course of a base course mix on a subgrade or sand subbase;
   c. Base course mixtures for shoulders and widening less than 10½ feet wide; or
   d. Top and leveling course mixes for shoulders and widening less than 8 feet wide.

   Place HMA mix in layers, and do not exceed the application rate. If the application rate for an HMA pavement exceeds the maximum rates specified in Table 501-4, and the edges are not confined, construct the pavement in at least two layers.

Table 501-4
HMA Application Rates

Mix Number	Course Application	Application Rate, (lb/yd²) minimum–maximum (a)
2	Base	435–550
3	Base, Leveling	330–410
4	Leveling, Top	220–275
5	Top	165–220
LVSP	Leveling, Top	165–250
LVSP	Base	220–330

a. Minimum application rates do not apply to wedging courses.

Wedge with HMA to remove irregularities in the existing road surface. Place and compact HMA wedging to correct the foundation. Allow the wedging to cool enough to support construction equipment without causing visible distortion of the mat before placing subsequent wedging, base, leveling, or top course mixtures.

Place HMA mix to the slope and width shown on the plans. Place subsequent HMA course to align the vertical edge with the previous courses, without constructing a ledge. Correct ledges that result from placing material in excess of the width shown on the plans at no additional cost to the Department.

Place shoulder aggregate and compact flush after placement of each layer of HMA at the end of the paving day or place traffic control devices in accordance with subsection 812.03, at no additional cost to the Department. Complete final shaping and compaction of the shoulders after placing the top course of HMA.

If delays slow paving operations and the temperature of the mat immediately behind the screed falls below 200 °F, stop paving and place a transverse construction joint. If the temperature of the mat falls below 190 °F before initial breakdown rolling, remove and replace the mat at no additional cost to the Department.

If placing the uppermost leveling and top course, place the longitudinal joint to coincide with the planned painted lane lines.

If the temperature of the mat falls below 170 °F before placing the adjacent mat, apply bond coat to the vertical edge of the mat.

If constructing the lanes with at least two pavers in echelon, match the depth of loose HMA from each paver at the longitudinal joints.

Transition the new mat to existing surfaces at the beginning and end of resurfacing sections and at intersections unless using butt joints. Transition the new mat to existing surfaces at a rate of 1 inch over 35 feet. Construct transitions on a cured bond coat applied at a rate of 0.10 gallons per square yard. After compaction, spray with bond coat, sand, and roll the first 3 feet of the joint and 1 foot of the existing surface.

2. **Joints in HMA Pavement.**

   a. **Transverse Construction Joint.** If constructing a transverse construction joint, stop the paver and lift the screed before material falls below the auger shaft. Remove the paver and roll through the planned joint location. Cut a transverse vertical joint and remove excess HMA.

Place burlap, canvas, or paper as a bond breaker ahead of, and against the vertical face. Place HMA against the bond breaker and taper from the new mat to the existing surface. Extend the temporary taper 5 feet for each inch of mat thickness, or as directed by the Engineer. Compact and cool the temporary taper before allowing traffic on the new surface. Remove the temporary taper before resuming paving.

b. **Vertical Longitudinal Joint.** When opening to traffic, plan the work to resurface adjacent lanes to within one load of the same ending point at the completion of paving operations each day. Construct a vertical joint to conform to the pavement cross section.

When compacting an unsupported (unconfined) edge of the mat, keep the roller from 3 inches to 6 inches inside the unsupported edge on the first pass; ensure the roller overhangs the unsupported edge by 3 inches to 6 inches on the second pass.

When placing HMA in a lane adjoining a previously placed lane, place the mixture so that the strike off shoe will produce an edge that is adjacent to or minimally overlaps the adjoining course. Compact the longitudinal joint by rolling from the hot side, keeping the edge of the roller approximately 6 inches to 8 inches inside the cold joint for the first pass. For the second pass of the roller, compact the joint from the hot side while overlapping the cold side by 6 inches to 8 inches.

c. **Tapered Overlapping Longitudinal Joint.** The Engineer will allow a tapered overlapping longitudinal joint in lieu of a longitudinal vertical joint.

If using tapered overlapping longitudinal joints, the Engineer will not require resurfacing lanes within one load of the same point-of-ending at the completion of paving operations each day. Pave adjacent lanes within 24 hours, unless delayed by inclement weather or approved by the Engineer.

Construct the tapered overlapping longitudinal joint by tapering the HMA mat at a slope no greater than 1:12. Extend the tapered portion beyond the normal lane width.

Place a ½-inch to 1-inch notch at the top of the taper on paving courses.

Provide a uniform slope by constructing the tapered portion of the mat using a Department-approved strike-off device that will not restrict the main screed.

Apply bond coat to the surface of the taper before placing the adjacent lane.

3. **Placing HMA Shoulders.** Use a self-propelled mechanical paver or spreader to place HMA shoulders.

   If placing the top course on new shoulders, or placing leveling, or top course on existing HMA shoulders at least 8 feet wide, place the mix using a paver with an automatically controlled and activated screed and strike-off assembly and corresponding grade referencing equipment. Use grade-referencing equipment, as directed by the Engineer.

   Stop shoulder paving at crossroad approaches, auxiliary lanes, commercial driveways, and ramps. Do not pave through these areas.

4. **Placing HMA Approaches.** Place HMA on driveway or crossroad approach foundations, approved by the Engineer.

   Place approaches in layers no greater than the application rate. Do not stop mainline paving of lanes adjacent to the approach to pave the HMA approach.

G. **Rolling.** Compact each layer of HMA in accordance with the contract and free of roller marks.

Keep the surface of the steel roller wheels moist during rolling.

H. **Smoothness Requirements.** After final rolling, the Engineer may test the surface longitudinally and transversely using a 10-foot straightedge at selected locations in accordance with MTM 722. Construct the surface and correct variations, at no additional cost to the Department, to the tolerances specified in this subsection.

1. **Base Course.** Construct lower layers of base courses to a tolerance of ¾ inch, and final layers of base courses to a tolerance of ⅜ inch.

2. **Leveling and Top Course.** For multiple course construction, construct lower courses to a tolerance of ¼ inch, and top courses to a tolerance of ⅛ inch.

   Construct single courses to a tolerance of ¼ inch.

I. **Weather and Seasonal Limitations.**

1. **HMA Weather Limitations.** Except as limited by subsection 501.03.I.2, place HMA in accordance with the following restrictions:

   a. Do not place HMA or apply bond coat when moisture on the existing surface prevents curing;
   b. Do not place HMA unless the temperature of the surface being paved is at least 35 °F and there is no frost on or in the grade or on the surface being paved, unless otherwise approved by the Engineer in writing;
   c. Place only HMA courses that are greater than 200 pounds per square yard if the temperature of the surface being paved is greater than 35 °F;
   d. Place only HMA courses that are greater than 120 pounds per square yard if the temperature of the surface being paved is at least 40 °F; and
   e. Place any HMA course if the temperature of the surface being paved is at least 50 °F

2. **HMA Seasonal Limitations.** Unless otherwise approved by the Engineer in writing, place HMA in accordance with subsection 501.03.I.1 and the following seasonal limitations.

   a. From June 1 to October 15 for the Upper Peninsula;
   b. From May 15 to November 1 for the Lower Peninsula, north of M-46; and
   c. From May 5 to November 15 for the Lower Peninsula, south of M-46.

J. **Protection of Structures.** Protect bridges, curbs, gutters, driveways, sidewalks, barriers, and other appurtenances to prevent surfaces from becoming discolored during application of bond coat or HMA to the road surface. Remove material from appurtenances, as directed by the Engineer, at no additional cost to the Department.

K. **Aggregate Shoulders.** On resurfacing projects, scarify existing aggregate shoulder surfaces before placing new aggregate material.

Maintain the shoulder for vehicles to pass the construction equipment. If Contractor operations or traffic disturbs the area between the pavement and the right-of-way line, restore the area to a condition approved by the Engineer at no additional cost to the Department.

L. **Monument Boxes.** Place or adjust monument boxes in accordance with section 821.

M. **Quality Control (QC) Plan.** Prepare and implement a quality control (QC) plan for HMA, in accordance with the *HMA Production Manual.*

Make adjustments in process controls to prevent production of non-conforming material in lieu of accepting payment at a reduced price. The Department will not allow continual production of non-conforming material at a reduced price in lieu of making adjustments.

The Engineer will not perform sampling or testing for quality control or assist in controlling the HMA production and placement operations.

N. **HMA Mix Acceptance.** The Engineer will inspect field-placed material, perform QA sampling and testing, and monitor Contractor adherence to the HMA-QC Plan.

1. **HMA Field-Placed Inspection.** The Engineer will perform inspection acceptance of HMA. The Department will inspect the base and leveling courses within 18 hours and the top course within 36 hours of placement. The Engineer will accept the pavement within these timeframes unless corrective action is required. If the Engineer determines that corrective action is required, inspection acceptance and paving of overlying courses will not occur until after the Contractor completes corrective action and the Engineer has determined that the pavement is in conformance with the contract.

   The Engineer will determine the need for corrective action based on the acceptance factors specified in Table 501-5. Corrective action may include remedial treatment, including crack or surface sealing, or replacement.

   Submit an action plan to the Engineer that addresses all acceptance factors that resulted in the need for corrective action. Complete all corrective action required to repair or replace unacceptable work at no additional cost to the Department.

   If the Engineer and the Contractor agree, the Department may make a contract adjustment of no greater than 100 percent of the bid price for corrective action.

   The Department will not grant time extensions for repair work to meet the inspection acceptance requirements specified in subsection 501.04.N.1.

   The Engineer will determine the area subject to corrective action, for removal and replacement of top courses, as the longitudinal extent of corrective action multiplied by the width of the paving course affected.

The Department will accept HMA subject to corrective action as follows:

a. HMA placed for corrective action involving full removal and replacement will be accepted in accordance with the contract.
b. The area requiring corrective action other than full removal and replacement will not be measured for incentive payment.
c. If more than 10 percent of the area of a sublot requires corrective action, the sublot will not be measured for incentive payment.

2. **HMA Testing Acceptance.** The Engineer will accept HMA based on visual inspection, small tonnage, or QA sampling and testing acceptance criteria. The Engineer will notify the Contractor before conducting QA sampling to allow the Contractor to witness the sampling, but not in a manner that will allow alteration of production in anticipation of sampling. The Engineer will conduct QA sampling in accordance with MTM 313.

   a. **Visual Inspection Acceptance Criteria.** The Engineer may accept quantities less than 500 tons, of any individual mixture, in accordance with the Materials Quality Assurance Manual.

   b. **Small Tonnage Acceptance Criteria.** If the total tonnage of a specific mix does not exceed 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.

   c. **QA Sampling and Testing Acceptance Criteria.** If the total tonnage of a specific mix is greater than 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.

O. **Asphalt Binder Acceptance.** The Department will accept asphalt binder in accordance with Department procedures.

Table 501-5
HMA Acceptance Factors and Corrective Action

Acceptance Factors (a)	Length	Extent (b)	Severity	Corrective Action (c)
Segregation	—	>215 ft²/ 328 ft LL	Heavy (d)	Replace
Rutting	—	>32 ft	>¼ in average depth over the length of occurrence	Replace
Flushing	—	>108 ft²/ 328 ft LL	High (e)	Replace
Edge of Paved Shoulder	>33 ft	visible ledges	>3 in	Trim
Crack (g)	any	any	all	Seal (f)

Note: LL = lane length.
a. Acceptance factors apply to all courses except flushing, which applies to the top course only.
b. Extent is calculated by summing locations within the length required.
c. The appropriate corrective action is dependent on the extent and severity of the factor, and on the intended service life of the pavement.
d. Segregation severity will be determined in accordance with MTM 326. If segregation thresholds are met twice on a paving course, the Contractor may be required to use a Material Transfer Device for the remaining paving for that course at no additional cost to the Department.
e. Flushing severe enough to significantly effect surface friction (Friction Number <35).
f. Other corrective action may be required as crack frequency increases.
g. A reflective crack determined by the Engineer to be caused by an underlying condition.

501.04. Measurement and Payment.

Pay Item	Pay Unit
HMA, 5 E __	Ton
HMA, 4 E __	Ton
HMA, 3 E __	Ton
HMA, 2 E __	Ton
HMA, LVSP	Ton
HMA, (type), High Stress	Ton
HMA Approach	Ton
HMA Approach, High Stress	Ton
Pavt for Butt Joints, Rem	Square Yard
Edge Trimming	Foot
Cold Milling HMA Surface	Square Yard, Ton
HMA Surface, Rem	Square Yard
HMA Patch, Rem	Square Yard
Joint and Crack, Cleanout	Foot
Hand Patching	Ton
Pavt, Cleaning	Lump Sum
Pavt Joint and Crack Repr, Det __	Foot

501.04

A. **HMA, (type), High Stress.** The Department may pay for **HMA, (type), High Stress** for up to 150 feet outside the limits shown on the plans to ensure the Contractor has time to transition to the high stress HMA. The Department will pay for high stress HMA placed outside the 150-foot limit as other HMA mix pay items.

B. **Pavement for Butt Joints, Removal.** The unit price for **Pavt for Butt Joints, Rem** includes the cost of removing and disposing of concrete or HMA materials.

C. **Edge Trimming.** The Engineer will measure **Edge Trimming** along the cut edge. The unit price for **Edge Trimming** includes the cost of cutting, removing, and disposing of excess HMA material.

D. **Cold Milling HMA Surface.** The unit price for **Cold Milling HMA Surface** includes the cost of removing, loading, hauling, weighing and disposing of the cold milled material, and cleaning the cold milled pavement. If paid by the ton for cold-milled HMA, deposit the cold milled material directly from the cold milling machine into the hauling units and weigh on a scale meeting the requirements of subsection 109.01.G before placement in a stockpile or a disposal area.

The Engineer will not weigh or pay for material picked up by cleaning after cold milling.

E. **Pavement, Cleaning.** The Engineer will measure **Pavt, Cleaning** as a unit, including paved shoulders, approaches, and widened areas. The unit price for **Pavt, Cleaning** includes the cost of cleaning the foundation, joints, and cracks, and sweeping shoulders, base courses, and leveling courses.

If the Engineer directs additional hand or mechanical methods to clean the pavement, the Department will pay for this work as **Joint and Crack, Cleanout** if the contract documents include the pay item. If the contract documents do not include a pay item for joint and crack cleanout, the Department will pay for additional hand or mechanical work as extra work, in accordance with subsection 109.07.

F. **Joint and Crack, Cleanout.** The Engineer will measure **Joint and Crack, Cleanout** along the cleaned joint and crack. If using compressed air does not completely clean out the joint or crack, and the Engineer directs the use of hand or mechanical methods to remove loose material, then the Department will pay for this as extra work, in accordance with subsection 103.02.

G. **Hand Patching.** The unit price for **Hand Patching** includes the cost of placing HMA, by hand or other methods, and compacting the material.

H. **Removing HMA Surface.** The Engineer will measure, and the Department will pay for removing HMA surface, no greater than 12 inches thick, overlying material to remain in place, as **HMA Surface, Rem**. The unit price for **HMA Surface, Rem** includes the cost of edge cutting to establish a neat line, as required, and removal and disposal of the HMA material.

The Engineer will measure and the Department will pay for removing HMA surface, greater than 12 inches thick, overlying material to remain in place, as **Pavt, Rem** in accordance with subsection 204.04.

I. **Pavement Joint and Crack Repair.** The Engineer will measure **Pavt Joint and Crack Repr**, of the detail required, along the joint and crack. If the pavement joint and crack repair exceeds 30 inches in width, the Engineer will measure each 30-inch wide segment, or portion thereof, separately for payment. The Department will pay for the HMA material used to fill the joints, after removal of objectionable material, as **Hand Patching**.

J. **HMA.** The Engineer will measure, and the Department will pay for, **HMA** of the mix specified based on the weight placed, as supported by weigh tickets. The Engineer will adjust the unit price for HMA, of the mix specified, in accordance with the contract.

602 - Culverts and Drains

602.03_0910_us_06_23_2004

602.03 General.

Add the following:

Ensure that the final installed alignment of all pipe allows no reverse grades, and does not permit horizontal and vertical alignments to vary from a straight line drawn from center of inlet to center of outlet by more than 2 percent of pipe center length or 1.0 feet, whichever is less.

Precast concrete box culvert sections shall be manufactured to Section 706.07. The culvert shall be designed for the proposed geometry and AASHTO HL-93, Modified loading. HL-93, Modified loading is defined as 1.2 times the current AASHTO LRFD Bridge Design Specification HL-93 loading, with the exception that the design tandem portion of the HL-93 load definition shall be replaced by a single 60 kip axle before application of this 1.2 factor. The current version of the FHWA-approved BOXCAR program shall be used to design the culvert. Furnish shop drawings and documentation from the fabricator showing adequacy of the culvert design. This documentation must be sealed by a professional engineer licensed in the State of Michigan.

602.10 Payment.

Add the following:

Payment includes design, fabrication, and installation of culvert sections, end sections, headwalls, footings, connection assemblies, and joint treatments. Payment also includes structure excavation, geotextile, bedding and structure backfill required for the installation.

625 – Turf Establishment

625.07 Seeding.

Add the following:

The seed mixture shall be MDOT Cereal Rye mixture, consisting of (by weight) 100% annual rye, placed at 70 pounds per acre.

Apply permanent seeding between May 1 and September. Seeding outside of these times only with the Contract Officer's approval.

Dormant seeding shall be allowed only with approval of the Contract Officer and after October 31, but prior to freezing of the ground.

625.10 Acceptance.

Add the following:

Seeding must be well established, weed-free, in a growing and vigorous condition, and contain all the species called for in the seed mixture.

629 – Rolled Erosion Control Products and Cellular Confinement Systems

629.09 Payment.

Add the following:

Where RECP is placed over seeded and fertilized areas, payment will be made for both Seeding, Fertilizing, and Mulching and Erosion Control Mat pay items.

635 - Temporary Traffic Control

635.03_nat_us_05_13_2004

635.03 General.

Delete the first sentence and replace with the following:

Install and maintain temporary traffic control devices adjacent to and within the project as required by the maintaining traffic plan, Section 156, and the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

Add the following:

Install temporary traffic control signs to temporary posts or approved temporary sign mounts.

635.27 Payment.

Add the following:

All work required to maintain traffic is included in the pay items listed in the bid schedule. The Temporary Traffic Control pay item includes flag control, staging earthwork, dust control, channelizing devices, and any other work required for traffic maintenance and staging as directed by the CO.

703 - Aggregate

703.05_nat_us_08_14_2009

703.05 Subbase, Base, and Surface Course Aggregate.

(a) General.

Delete the first sentence and replace with:

"Furnish base aggregate material conforming to MDOT 22A Aggregate, as defined in MDOT Standard Specification for Construction Section 902 (attached). For subbase and surface course aggregate, furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming to the following: "

(b) Subbase or base aggregate.

Delete the title and replace with:

(b) Subbase aggregate.

Section 902. AGGREGATES

902.01 General Requirements. Approval of aggregates at the producing plant does not constitute a waiver of the Department's right to inspect and test at the point of actual use. Furnish equipment or the means necessary to allow safe access to the material for sampling from haul units or stockpiles.

Aggregate must be transported and placed without material loss or contamination when it is loaded and measured. Foundry sand which has been used for metal castings is not permitted on Department projects in any form.

902.02 Testing. Testing will be by the methods specified throughout this section and by the following general methods

Wire Cloth and Sieves	ASTM E 11
Materials Finer than 75mm (No. 200) Sieve in Mineral Aggregates by Washing	ASTM C 117
Specific Gravity and Absorption of Coarse Aggregate	ASTM C 127
Specific Gravity and Absorption of Fine Aggregate	ASTM C 128
Sieve Analysis of Fine and Coarse Aggregates	ASTM C 136
Sampling and Testing Fly Ash	ASTM C 311
Sand Equivalent of Fine Aggregate	ASTM D 2419
Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate	ASTM D 4791
Organic Impurities in Fine Aggregate	AASHTO T 21
Sieve Analysis of Mineral Filler	AASHTO T 37
Mortar Strength	AASHTO T 71
Particle Size Analysis	AASHTO T 88
Water Asphalt Preferential Test	MTM 101
L.A. Abrasion Resistance of Aggregate	MTM 102
Insoluble Residue in Carbonate Aggregate	MTM 103
Sampling Aggregates	MTM 107
Loss by Washing	MTM 108
Sieve Analysis of Aggregate	MTM 109
Deleterious and Objectionable Particles	MTM 110
Aggregate Wear Index	MTM 112
Selection and Preparation of Coarse Aggregate Samples for Freeze-Thaw Testing	MTM 113
Making Concrete Specimens for Freeze-Thaw Testing on Concrete Coarse Aggregate	MTM 114
Freeze-Thaw Testing of Coarse Aggregate	MTM 115

902.02

Crushed Particles in Aggregates. . . . . MTM 117
Angularity Index of Fine Aggregate. . . . . MTM 118
Dry Unit Weight (LM) of Coarse Aggregate . . . . . MTM 123

A. **Terminology**. The following terminology is used in the testing and acceptance of aggregates:

1. **Natural Aggregates**. Originating geologically from stone quarries, gravel, sand or igneous/metamorphic rock deposits.

2. **Slag Aggregates**. By-products formed in the production of iron, copper, and steel.

   a. Iron blast furnace slag is a synthetic nonmetallic by-product produced simultaneously with pig iron in a blast furnace. The slag consists principally of a fused mixture of oxides of silica, alumina, calcium, and magnesia.

   b. Reverberatory furnace slag is a nonmetallic by-product resulting from refining copper ore.

   c. Steel furnace slag is a synthetic by-product of basic oxygen, electric, or open hearth steel furnaces and consists principally of a fused mixture of oxides of calcium, silica, iron, alumina, and magnesia.

3. **Crushed Concrete Aggregate**. Produced by crushing Portland cement concrete.

4. **Salvaged Aggregate**. Any dense-graded aggregate saved or manufactured from Department project sources. The material may consist of natural aggregate, blast furnace slag, crushed concrete, or reclaimed asphalt pavement with a maximum two inch particle size and no visible organic or foreign matter, including steel reinforcement.

5. **Manufactured Fine Aggregate**. Produced by totally crushing rock, gravel, iron blast furnace slag, reverberatory furnace slag, steel furnace slag, or Portland cement concrete.

6. **Natural Sand 2NS and 2MS**. Fine granular material resulting from the natural disintegration of rock. The material must be clean, hard, durable, uncoated particles of sand, free from clay lumps and soft or flaky material. These aggregates are used in concrete mixtures, mortar mixtures, and intrusion grout for pre-placed aggregate concrete.

7. **Stone Sand 2SS**. Manufactured from stone meeting all the physical requirements of Coarse Aggregate 6A. Stone sand is permitted only in concrete base course or in structural concrete not exposed to vehicular traffic.

8. **Soft Particles**. Non-durable particles that are structurally weak or experience environmental deterioration in service; includes shale, siltstone, friable sandstone, ochre, coal, and clay-ironstone.

9. **Crushed Particles**. One which has one or more fractured faces. The number of fractured faces is determined by its use.

10. **Base Fineness Modulus**. The average fineness modulus typical of the source for a specific fine aggregate.

11. **Cobblestones (Cobbles)**. Rock fragments, usually rounded or semi-rounded, with an average dimension between 3 and 10 inches.

902.03 Coarse Aggregates for Portland Cement Concrete. Use Michigan Class 4AA, 6AAA, 6AA, 6A, 17A, and 26A coarse aggregate produced from natural aggregate, iron blast furnace slag, or reverberatory furnace slag sources. Michigan Class 6A, 17A and 26A may be produced by crushing Portland cement concrete, but only for uses stipulated by this specification. The bulk dry specific gravity must be within the limits established by freeze-thaw testing. Aggregates must conform to the grading requirements in Table 902-1, the physical requirements in Table 902-2, and the following.

A. **Slag Coarse Aggregate**. Iron blast furnace slag or reverberatory furnace slag conforming to the grading specified for the concrete mixture must have a dry (loose measure) unit weight of not less than 70 pounds per cubic foot as determined by MTM 123.

B. **Crushed Concrete Coarse Aggregate**. Use only crushed concrete coarse aggregate originating from concrete sources owned by the Department as part of the contracted project. Crushed concrete coarse aggregate may be used in concrete mixtures for curb and gutter, valley gutter, sidewalk, concrete barriers, driveways, temporary pavement, interchange ramps with commercial ADT below 250, and concrete shoulders. Crushed concrete coarse aggregate may not be used in mainline pavements or ramps with commercial ADT equal to or greater than 250, concrete base course, bridges, box or slab culverts, head walls, retaining walls, prestressed concrete, or other heavily reinforced concrete.

902.03

Process crushed concrete coarse aggregate in a manner that avoids contamination with any non-concrete materials including joint sealants, HMA patching, and base layer aggregate or soil. Contamination particles retained on the-inch sieve are limited to 3.0 percent maximum by particle count of the total aggregate particles. The aggregate stockpile will be rejected totally when there is any evidence of contamination from non-Department sources such as building brick, wood, or plaster. Pieces of steel reinforcement are allowable in the stockpile provided they pass the maximum grading sieve size without hand manipulation. The fine aggregate portion of the gradation must not exceed a liquid limit of 25.0 percent or a plasticity index of 4.0.

Crushed concrete coarse aggregate will be tested for freeze-thaw durability for each project. This testing requires a minimum of three months after samples of the produced aggregate are received in the laboratory.

Use equipment and methods to crush concrete that will maintain uniformity in aggregate properties: specific gravity ± 0.05 and absorption ± 0.40, with no apparent segregation. This requirement includes separating crushed concrete aggregate according to its original coarse aggregate type, except for the following situations:

1. Different aggregate types may exist in the same stockpile if the quantities by weight of each aggregate type retained on the No. 4 sieve do not differ by more than ± 10 percent from the average quantity obtained from at least three representative samples.

2. When aggregate is produced from concrete pavement with only one aggregate type that has been repaired with concrete patches with a different aggregate type.

902.04 Coarse Aggregates for HMA Mixtures. Use natural aggregate, iron blast furnace slag, reverberatory furnace slag, steel furnace slag, or crushed concrete meeting the grading and physical requirements in the contract documents.

902.05 Coarse Aggregates for Chip Seals. Use chip seal 25A coarse aggregate that meets both the grading and physical requirements in Table 902-1 and 902-2 and the following; have a minimum AWI of 260, a maximum moisture content of 4 percent at the time of placement and meet any special requirements stated in section 508. There is no AWI requirement for shoulder chip seal aggregates.

902.06 Dense-Graded Aggregates for Base Course, Surface Course, Shoulders, Approaches and Patching. Use Michigan Class 21AA, 21A, 22A, and 23A dense-graded aggregates that consist of natural aggregate, iron blast furnace slag, reverberatory furnace slag, or crushed concrete, in combination with fine aggregate as necessary to meet the gradation requirements in Table 902-1, the physical requirements in Table 902-2, and the following:

A. Dense-graded aggregate produced by crushing Portland cement concrete must not contain building rubble as evidenced by the presence of more than 5.0 percent, by particle count, building brick, wood, plaster, or similar materials. Sporadic pieces of steel reinforcement may be present provided they pass the maximum grading sieve size without hand manipulation.

B. Class 21AA, 21A and 22A dense-graded aggregate produced from crushing Portland cement concrete may not be used to construct either an aggregate base or aggregate separation layer when either of the following conditions apply:

1. When there is a geotextile liner or membrane present with permeability requirements.

2. In a pavement structure with an underdrain, unless there is a filter material between the crushed concrete and the underdrain. This filter material must be either a minimum of 12 inches of granular material or a geotextile liner or blocking membrane that will be a barrier to leachate.

C. Class 23A dense-graded aggregate may be produced from steel furnace slag, but only for use as an unbound aggregate surface course or as an unbound aggregate shoulder.

902.07 Open-Graded Aggregates for Earthwork, Open-Graded Drainage Courses and Underdrains. Use Michigan Class 2G, 3G, 4G, 34G, and 34R open-graded aggregates obtained from natural aggregate, iron blast furnace slag, or reverberatory furnace slag. These aggregates must conform to the grading requirements in Table 902-1, and the physical requirements in Table 902-2.

Table 902-1 Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material Type	Class	Item of Work by Section Number (Sequential) (a)	Sieve Analysis (MTM 109) Total Percent Passing (b)										Loss by Washing (MTM 108) % Passing No. 200 (b)
			2.5 in	2 in	1.5 in	1 in	¾ in	½ in	⅜ in	No. 4	No. 8	No. 30	
Coarse Aggregates	4 AA (c)	602	100	90—100	40—60		0-12						2.0 max.
	6 AAA (c)	602			100	90-100	60-85	30-60		0-8			1.0 max.(d)
	6 AA (c)	601,602, 706,708,806			100	95-100		30-60		0-8			1.0 max.(d)
	6 A	205,401,402, 601, 602, 603,706,806			100	95-100		30-60		0-8			1.0 max.(d)
	17 A					100	90-100	50-75		0-8			1.0 max.(d)
	25 A	508					100	95-100	60-90	5-30	0-12		3.0 max.
	26 A	706,712					100	95-100	60-90	5-30	0-12		3.0 max.
	29 A	508						100	90-100	10-30	0-10		3.0 max.
Dense-Graded Aggregates	21 AA	302,304,503			100	85-100		50-75			20-45		4-8 (e)(f)
	21 A	302,503											
	22 A	302,306,307,503				100	90-100		65-85		30-50		4-8 (e)(f)(g)
	23 A	306,307				100			60-85		25-60		9-16 (f)
Open-Graded Aggregates	2 G	303(h)			100	85-100		40-70			0-10	0-8	5.0 max.
	3 G				100	85-100		40-70			0-30	0-13	5.0 max.
	4 G (i)	303			100		60-80	35-65			10-25	5-18	6.0 max.
	34 R	404						100	90-100		0-5		3.0 max.
	34 G	404						100	95-100		0-5		3.0 max.

Table 902-1 Grading Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates (Continued)

a. Designated Item of Work (Section)

205 Roadway Earthwork	502 Temporary Patching with HMA Mixture
302 Aggregate Base Courses	508 Chip Seals
303 Open-Graded Drainage Courses	601 PCC Pavement Mixtures
304 Rubblizing Existing PCC Pavement-Filler Aggregate	602 Concrete Pavement Construction
306 Aggregate Surface Course	603 Concrete Pavement Repair
307 Aggregate Shoulders and Approaches	706 Structural Concrete Construction
401 Culverts	708 Prestressed Concrete Beams
402 Storm Sewers	712 Bridge Rehabilitation-Concrete
404 Underdrains-Trench Backfill	806 Bicycle Paths

b. Based on dry weights.

c. Class 6AAA will be used exclusively for all mainline and ramp concrete pavement when the directional commercial ADT is greater than or equal to 5000 vehicles per day.

d. Loss by Washing will not exceed 2.0 percent for material produced entirely by crushing rock, boulders, cobbles, slag, or concrete.

e. When used for aggregate base courses, surface courses, shoulders and approaches and the material is produced entirely by crushing rock, boulders, cobbles, slag, or concrete, the maximum limit for Loss by Washing must not exceed 10 percent.

f. The limits for Loss by Washing of dense-graded aggregates are significant to the nearest whole percent.

g. For aggregates produced from sources located in Berrien County, the Loss by Washing must not exceed 8 percent and the sum of Loss by Washing and shale particles must not exceed 10 percent.

h. For use with stabilized aggregate base.

i. Acceptance gradation at production site only.

Table 902-2 Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates

Material	Series/ Class	Gravel, Stone, and Crushed Concrete						Slag (a)		All Aggregates
		Crushed Material, % min (MTM 110,117)	Loss, % max, Los Angeles Abrasion (MTM 102)	Soft Particles, % max (MTM 110)	Chert, % max (MTM 110)	Sum of Soft Particles and Chert, % max (MTM 110)	Freeze-Thaw Dilation, % per 100 cycle max (MTM 115) (d)	Sum of Coke and Coal Particles, % max (MTM 110)	Freeze-Thaw Dilation, % per 100 cycles max (MTM 115) (d)	Flat and Elongated Particles, ratio - % max (ASTM D 4791)
Coarse Aggregates	4 AA (b)		40			2.0 (c)	0.020	1.0	0.020	3:1—15.0 (l)
	6 AAA		40	2.0 (e)	2.5	4.0	0.040 (f)	1.0	0.040 (f)	
	6 AA (g)		40	2.0 (e)		4.0	0.067 (h)	1.0	0.067	
	6 A (g)		40	3.0 (e)	7.0	9.0	0.067	1.0	0.067	
	17 A (g)		40	3.5 (e)	8.0	10.0	0.067	1.0	0.067	
	25 A	95	45	8.0 (i)		8.0		1.0		3:1—20.0 (m)
	26 A (g)		40	2.0 (e)		4.0	0.067	1.0	0.067	
	29 A	95	45	8.0 (i)		8.0		1.0		3:1—20.0 (m)
Dense-Graded Aggregates (j)	21 AA	95	50							
	21 A	25	50							
	22 A	25	50							
	23 A	25	50							
Open-Graded Aggregates	2 G	90	45 (k)							
	3 G	95	45 (k)							
	4 G	95	45 (k)							
	34 R	20 max	45 (k)							
	34 G	100	45 (k)							

Table 902-2 Physical Requirements for Coarse Aggregates, Dense-Graded Aggregates, and Open-Graded Aggregates (Continued)

a. Iron blast furnace and reverberatory furnace slag must contain no free (unhydrated) lime.
b. 2.50 percent maximum 24 hour soak absorption based on oven dry 6 series aggregate.
c. 1.0% maximum for particles retained on the 1 inch sieve.
d. If the bulk dry specific gravity is more than 0.04 less than the bulk dry specific gravity of the most recently tested freeze-thaw sample, the aggregate will be considered to have changed characteristics and be required to have a new freeze-thaw test conducted prior to use on Department projects.
e. Clay-ironstone particles must not exceed 1.0 percent for 6AAA, 6AA and 26A, and 2.0 percent for 6A and 17A. Clay-ironstone particles are also included in the percentage of soft particles for these aggregates.
f. Maximum freeze-thaw dilation is 0.067 when the directional commercial ADT is less than 5000 vehicles per day.
g. Except for pre-stressed beams, the sum of soft and chert particles may be up to 3.0 percent higher than the values determined from the sample tested for freeze-thaw durability. However, under no circumstances will the deleterious particle percentages exceed the specification limits in Table 902-2. In addition, a source may be restricted to a minimum percent crushed not to exceed 15 percent less than the percent crushed in the freeze-thaw sample. When the freeze-thaw dilation is between 0.040 and 0.067 percent per 100 cycles, more restrictive limits will be applied.
h. Maximum dilation of 0.010 for prestressed concrete beams.
i. Friable sandstone is included in the soft particle determination for chip seal aggregates.
j. Quarried carbonate (limestone or dolomite) aggregate may not contain over 10 percent insoluble residue finer than No. 200 sieve when tested in accordance with MTM 103.
k. If a blend of different aggregate sources, the abrasion value applies to each source.
l. ASTM D 4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the 1 inch sieve.
m. ASTM D 4791 Section 8.4 will be followed. The test will be performed on the material retained down to and including the No. 4 sieve.

902.08 Granular Materials for Fill and Subbase. Use granular materials for fill, trench backfill, and subbase that consists of sand, gravel, crushed stone, iron blast furnace slag, reverberatory furnace slag or a blend of aggregates conforming to the grading requirements of Table 902-3 and this subsection.

When Class II material is specified, Class I material may be substituted. When Class III material is specified, Class I, Class II, Class IIA or Class IIIA material may be substituted.

Material with cementitious properties or with permeability characteristics that do not meet design parameters may not be used for fill or subbase.

When used for trench backfill, no aggregate particles larger than two inches may be placed within 12 inches of the pipe.

Granular material produced by crushing Portland cement concrete is an acceptable material for swamp backfill, embankment (except the top three feet below subgrade) and as trench backfill for non-metallic culvert and sewer pipes without associated underdrains. All other uses are unacceptable.

Granular material produced from steel furnace slag may be acceptable below the top three feet of the embankment and fill when permitted by the contract documents.

902.09 Fine Aggregates for Portland Cement Concrete and Mortar. The aggregate must be free from organic impurities to the extent that when subjected to the test for organic impurities, AASHTO T 21, it does not produce a color darker than Plate 3 (light brown). Fine aggregate failing this requirement may be approved for use provided the discoloration is due principally to the presence of small quantities of coal, lignite, or similar discrete particles; or the relative 7-day strength of the concrete under test is found to be at least 95 percent per AASHTO T 71.

The aggregate must be uniformly graded from coarse to fine and meet the grading requirements and fineness modulus variation requirements, specified in Table 902-4. The specified gradation represents the extreme limits which determine suitability for use from all sources of supply. The gradation from any one source must be reasonably uniform and not subject to the extreme percentages of gradation specified in Table 902-4.

Fine aggregate produced by crushing Portland cement concrete is not permitted.

902.10 Fine Aggregates for HMA Mixtures. Use fine aggregate for HMA mixtures consisting of clean, hard, durable, uncoated particles, free from clay lumps, organic materials, soft or flaky materials, and other foreign matter. These aggregates must be natural sand, manufactured fine aggregate, or a uniformly graded blend meeting the grading and physical requirements specified in the contract documents.

902.11 Fine Aggregates for HMA Surface Treatments.

A. **Slurry Seal.** Use 2FA fine aggregate consisting of crushed material from a quarried stone, natural gravel, slag source or a blend meeting the grading requirements of Table 902-4. Sands with Angularity Index less than 2.0 may not exceed 50 percent of the fine aggregate blend. This fine aggregate must have a maximum L.A. Abrasion value of 45 percent (MTM 102).

B. **Micro-Surfacing.** Use 2FA and 3FA fine aggregates, consisting of crushed material from a quarried stone, natural gravel, slag source, or a blend meeting the grading requirements of Table 902-4. Micro-surfacing aggregate must have a minimum AWI of 260 (MTM 111), a minimum sand equivalent (ASTM D 2419) of 60 percent and a minimum angularity index (MTM 118) of 4.0 for natural gravel, quarried stone or slag. These fine aggregates must have a maximum L.A. abrasion value of 45 percent (MTM 102).

902.12 Mineral Filler for Bituminous Mixtures. Mineral filler, 3MF, must be limestone dust, dolomite dust, fly ash collected by an electrostatic precipitation method, slag or hydrated lime. The free carbon in the fly ash may not exceed 12 percent by weight as measured by the loss on ignition test according to ASTM C 311. Sources for fly ash must be selected from the Qualified Products List. Fly ash from a new source must show satisfactory performance on the basis of both laboratory mix stability tests and actual construction field experience.

Mineral filler must be dry and have 100 percent passing the No. 30 sieve and 75 to 100 percent passing the No. 200 sieve.

The fraction passing the No. 200 sieve must have 15-60 percent finer than 10 micron diameter. The sub-sieve particle size distribution will be determined according to AASHTO T 88, using Tucker dispersing agent.

Mineral filler must be free of objectionable characteristics as measured by MTM 101.

Table 902-3 Grading Requirements for Granular Materials

Material	Sieve Analysis (MTM 109) Total % Passing (a)									Loss by Washing % Passing No. 200 (a) ()b
	6 in	3 in	2 in	1 in	½ in	⅜ in	No. 4	No. 30	No. 100	
Class I			100		45-85		20-85	5-30		0-5
Class II (c)		100		60-100					0-30 (d)	0-7 (d)
Class IIA (c)		100		60-100					0-35	0-10
Class III	100	95-100								0-15
Class IIIA						100			0-30	0-15

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Except for use in granular blankets and underdrain backfill, Class IIA granular material may be substituted for Class II granular material for projects located in the following counties: Arenac, Bay, Genesee, Gladwin, Huron, Lapeer, Macomb, Midland, Monroe, Oakland, Saginaw, Sanilac, Shiawassee, St. Clair, Tuscola, and Wayne counties.
d. Grading requirements are 0-20 for the No. 100 sieve and 0-5 for loss by washing when material is used as backfill for underdrains.

Table 902-4 Grading Requirements for Fine Aggregates

Material	Sieve Analysis (MTM 109) Total Percent Passing (a)							Loss by Washing % Passing No. 200 (a)(b)	Fineness Modulus Variation (c)
	3/8 in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100		
2NS	100	95-100	65-95	35-75	20-55	10-30	0-10	0-3.0	±0.20 (d)
2SS (e)	100	95-100	65-95	35-75	20-55	10-30	0-10	0-4.0	±0.20 (d)
2MS		100	95-100			15-40	0-10	0-3.0	±0.20 (d)
2FA (f)	100	90-100	65-90	45-70	30-50	18-30	10-21	5-15 (g)	
3FA (f)	100	70-90	45-70	28-50	19-34	12-25	7-18	5-15 (g)	

a. Test results based on dry weights.
b. Use test method MTM 108 for Loss by Washing.
c. Aggregate having a fineness modulus differing from the base fineness modulus of the source by the amount exceeding the maximum variation specified in the table, will be rejected. Use ASTM C 136.
d. The base fineness modulus will be supplied by the aggregate producer at the start of each construction season and be within the range of 2.50-3.35. The base FM, including the permissible variation, will be within the 2.50-3.35 range.
e. Not for any application subject to vehicular traffic.
f. Gradation represents the final blended product.
g. The limits for loss by Washing of Fine Aggregates, 2FA and 3FA are significant to the nearest whole percent.

704 - Soil

703.05_nat_us_08_14_2009

704.2 Bedding Material.

Delete 704.02 and replace with the following:

Furnish hard durable particles or fragments of crushed stone or gravel conforming to the following:

(a) Los Angeles Abrasion, AASHTO T 96 40% max

(b) Fractured Faces, ASTM D5821 90% min

(c) Gradation (AASHTO T11 & T27):

Sieve Size	**Percent Passing**
1.5-inch	100
1-inch	95 - 100
½-inch	30 – 60
No. 4	0 – 8
No. 200	1.0 max

705 - Rock

705.02_nat_us_08_05_2009

705.02 Riprap Rock.

Delete Table 705-1 and replace it with the following:

Gradation Requirements for Riprap

Class	Percent of Rock by Mass	Mass (pounds)	Approximate Cubic Dimension [b,c] (inches)
1	20	22 to 33	6 to 8
	30	11 to 22	5 to 6
	40	1 to 11	2 to 5
	10[a]	0 to 1	0 to 2
2	20	55 to 110	8 to 10
	30	22 to 55	6 to 8
	40	2 to 22	3 to 6
	10[a]	0 to 2	0 to 3
3	20	220 to 330	14 to 16
	30	110 to 220	10 to 14
	40	11 to 110	5 to10
	10[a]	0 to 11	0 to 5
4	20	550 to 770	18 to 20
	30	220 to 570	14 to 18
	40	22 to 220	6 to 14
	10[a]	0 to 22	0 to 6
4a	20	770 to1353	20 to 24
	30	330 to 770	16 to 20
	40	33 to 330	7 to16
	10[a]	0 to 33	0 to 7
5	20	1540 to 2200	26 to 28
	30	1100 to 1540	20 to 26
	40	55 to 1100	8 to 20
	10[a]	0 to 55	0 to 8
6	20	1870 to 3520	28 to 34
	30	1100 to 1870	22 to 28
	40	110 to 1100	10 to 22
	10[a]	0 to 110	0 to 10
7	20	4400 to 5940	35 to 39
	30	2200 to 4400	28 to 35
	40	220 to 2200	14 to 28
	10[a]	0 to 220	0 to 14
8	20	7000 to 10000	42 to 47
	30	4000 to 7000	35 to 42
	40	400 to 4000	16 to 35
	10[a]	0 to 400	0 to 16

(a) Furnish spall and rock fragments graded to provide a stable dense mass.
(b) The volume of a rock with these cubic dimensions has a mass approximately equal to the specified rock mass.
(c) Furnish rock with breadth and thickness at least one-third its length.

718 - Traffic Signing and Marking Material

718.05_nat_us_08_05_2009

718.05 Aluminum Panels

Delete the third paragraph and replace with the following:

Clean, degrease and properly prepare the panels according to methods recommended by the sheeting manufacturer. Conversion coatings will conform to ASTM B-921 or ASTM B-449.